

UTILITY PATENT

Attorney Docket APPLICATION

TRANSMITTAL

FIRST NAMED INVENTOR

OR APPLICATION IDENTIFIER

for nonprovisional applications under 37 CFR 1.53(b) Inventor: Odle et al

Title: PRINT ACCESS SECURITY SYSTEM

EXPRESS MAIL LABEL NO.: E1514193579US Date submitted: 11/21/00

APPLICATION ELEMENTS

(See MPEP chapter 600 concerning utility patent appln.)

Assistant Commissioner for Patents

Box Patent Application

Washington, D.C. 20231

1. ☒ Fee Transmittal Form  
(Submit an original, and a duplicate for fee processing)
- ☒ Specification 29 Total Pages  
(preferred arrangement set forth below)
  - Descriptive title of the Invention
  - Cross References to Related Applications
  - Statement Regarding Fed sponsored R&D
  - Reference to Microfiche Appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
3. ☒ Drawing(s) (35 USC 13) 2 New Sheets
4. ☒ Decl./Pow. of Att. 3 Total pages
  - a. ☐ Combined Executed (original or copy) for C-I-P application
  - b. ☐ Copy from a prior appln. (37 CFR 1.63(d))  
(for continuation/divisional with Box 17 completed)

**[Note Box 5 Below]**

  - I. ☐ Deletion of Inventor(s)  
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b)
5. ☐ Incorporation By Reference (useable if Box 4b is checked)  
The entire disclosure of the prior application, from which a copy of the Oath or Declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. Microfiche Computer Program (Appendix)
7. Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)
  - a. ☐ Computer Readable Copy
  - b. ☐ Paper Copy (Identical to computer copy)
  - c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS:

8. ☐ Assignment Papers (cover sheet & documents(s))
9. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney
10. ☐ English Translation Document (if applicable)
11. ☒ Information Disclosure ☒ Copies of IDS  
Statement (IDS)/PTO-1449 Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503)
14. ☐ Small Entity(2) ☐ Statement filed in prior  
(Unsigned) Statement(s) Application
15. ☐ Certified Copy of Priority Document(s)  
(If foreign priority is claimed)
16. ☐ Other: \_\_\_\_\_

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No. \_\_\_\_\_

18. CORRESPONDENCE ADDRESS

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09/718530 11/21/00

# FEE TRANSMITTAL

Date: 11/21/00

Total Amount DUE: \$ 355.00

## METHOD OF PAYMENT (check one)

1. ☐ The Commissioner is hereby authorized to charge the filing fees and any additional fees to:

Deposit:

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Deposit

Account Name: United States Filter Corporation

☐ Charge any additional Fee required under 37 CFR 1.15 and 1.17 ☐ Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of Notice of Allowance

## 2. ☐ Payment Not submitted

☒ Check ☐ Money Order ☐ Other

## FEE CALCULATION

### 1. FILING FEE

Large Entity	Small Entity				
Fee	Fee	Fee	Fee	FEE DESCRIPTION/FEE PAID	
Code	(\$)	Code	(\$)		
101	710	201	355	Utility filing fee	<u>355</u>
106	320	206	160	Design filing fee	_____
107	490	207	245	Plant filing fee	_____
108	710	208	355	Reissue filing fee	_____
114	150	214	75	Provisional filing fee	_____

**SUBTOTAL(1) \$355.00**

Fee from

### 2. CLAIMS

Total Claims 13 - 20 = -0 - x 9 = \$ -0-

Independent 1 - 3 = 0 x 40 = \$ -0-

Multiple Dep 0 x 135 = \$ \_\_\_\_\_

Claims

Large Entity	Small Entity				
Fee	Fee	Fee	Fee	FEE DESCRIPTION	
Code	(\$)	Code	(\$)		

103 22 203 11 Claims in excess of 20

102 82 202 41 Ind. Claims in excess of 3

104 270 204 135 Mult. Dependent claim

109 82 209 41 Reissue Independent Claims

over Original Patent

110 22 210 11 Reissue Claims in excess

20 and over original patent

**FEE SUBTOTAL(2) \$ 355.00**

\*Reduced by Basic filing fee **SUBTOTAL(3)** \_\_\_\_\_

Michael A. Slavin

Typed or printed Name: Michael A. Slavin

Signature: \_\_\_\_\_

Reg. No. 34,016

Date: 11/21/00 Dep. Acct.: \_\_\_\_\_

Application Number : N/A

Filing Date : N/A

First Named Inventor: Odle et al

Group Art Unit : N/A

Examiner Name : N/A

Attorney Docket No. : 2224.001

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES:

	Large Entity	Small Entity		
Fee	Fee	Fee	Fee	FEE DESCRIPTION
Code	(\$)	Code	(\$)	
105	130	205	65	Surcharge - late filing fee/oath
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.
139	130	139	130	Non-English specification
147	2520	147	2520	For filing a Request. for Exam.
112	920*	112	920*	Req. publication of SIR prior Examiner Action
115	110	215	55	Extension - first month
116	400	216	200	Extension - second month
117	950	217	475	Extension - third month
118	1510	218	755	Extension - fourth month
128	2060	228	1030	Extension - fifth month
119	310	219	155	Notice of Appeal
120	310	220	155	Brief in support of Appln.
21	270	221	135	Req. for Oral Hearing
138	1510	138	1510	Petition to Institute Public Use Proceeding
140	110	240	55	Pet. to revive - unavoidable
141	1320	241	660	Pet. To revive - unintentional
142	1320	242	660	Utility Issue Fee
143	450	243	225	Design Issue Fee
144	670	244	335	Plant Issue Fee
122	130	122	130	Petitions to Commissioner
123	50	123	60	Petitions re: Provisional
126	240	126	240	Sub. Of Infor. Discl. Stm.
581	40	581	40	Record. Patent Assign.
				Per property
146	290	246	395	Filing a Submission After Final rejection (37 CFR .129(a)
149	790	249	395	For each addnl. invention to be examined (37 CFR 1.129(b)

Other fee (specify) \_\_\_\_\_

Other fee (specify) \_\_\_\_\_

**STATEMENT CLAIMING SMALL ENTITY STATUS**  
**(37 CFR 1.9(e) & 1.27(b)) - INDEPENDENT INVENTOR**

Docket Number: 2224.001

Applicant, Patentee, or Identifier: Odle et al

Application or Patent No.: \_\_\_\_\_

Filed or Issued: \_\_\_\_\_

Title: PRINT ACCESS SECURITY SYSTEM

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☒ the specification filed herewith with title as listed above.  
☐ the application identified above.  
☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey or license any rights in the invention is listed below:

- ☒ No such person, concern, or organization exists.  
☐ Each such person, concern or organization is listed below.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

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Richard Odle

Richard Odle  
 Signature of inventor

11/20/00  
 Date

NAME OF INVENTOR

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X 11-21-2000  
 Date

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 Signature  
11/20/00  
 Date

00716530 112100

1                   Print Access Security System

2

3   FIELD OF THE INVENTION

4

5           This invention is related to security systems and,  
6 particularly, to identity recognition through comparison of  
7 an image of a finger and a stored template. The security  
8 system may be used to gain entry and to energize the systems  
9 of a vehicle.

10

11

12   BACKGROUND OF THE INVENTION

13

14           It is generally accepted that vehicles are items  
15 considered highly transportable by nature. Vehicles may  
16 include cars, trucks, buses, vans, construction equipment,  
17 water craft, motorcycles, airplanes, golf carts, snowmobiles,  
18 and, generally, anything that is capable of self powered  
19 mobility. Common to such vehicles is a key or keys for  
20 security of the interior and operation of the systems.  
21 However, a key can be used by anyone and is easily  
22 duplicated, rendering the security of the vehicle vulnerable  
23 to unauthorized use.

24           Some automobile manufacturers utilize different keys for

1 different functions. For instance, General Motors, for many  
2 years, employed one key for unlocking the doors and trunk and  
3 a second key for starting the engine. However, anyone who  
4 had access to the keys would be able to operate the vehicle.  
5 More recently, GM has made a key system that includes a  
6 microchip. These keys are extremely difficult to duplicate  
7 however, there are specialized vendors authorized to make  
8 copies. This program also degrades the security system.

9 Other security systems are in use. For instance, Ford  
10 Motor Company employs a keyless entry system which allows an  
11 individual to have a numeric or alphabetic code programmed  
12 into the keyless entry and a memory circuit stores the code  
13 for activation of the door locks upon entry of a correct code  
14 sequence. The code is typically maintained by the  
15 manufacturers as well as the local dealer. Thus, access to  
16 the code can be obtained by a number of people thereby  
17 degrading the efficacy of the system.

18 Currently, most automobile companies and after market  
19 suppliers offer small electronic door openers which cooperate  
20 with the electrical system in the auto to unlock doors.  
21 These devices are a convenience and may be overridden by a  
22 key. As such, these devices do not add any security to the  
23 system.

24 In addition to controlling entry to vehicles, there are

1 devices that will cause the engine to start and remotely  
2 operate various other electrical systems in the vehicle.  
3 However, for security purposes, these devices usually require  
4 a key for entry into the vehicle.

5 In both the electronic door locking devices and the  
6 electronic engine starters, there is a very real risk that  
7 the frequency used in the devices may be captured by  
8 unauthorized persons using scanners or like devices. Also,  
9 these devices and their associated circuits are over-ridden  
10 by the use of the key. Therefore, anyone with the frequency  
11 code or a key or both can operate the vehicle.

12 However, what is lacking in the art is a stand alone  
13 security system that is hard wired into the vehicle and  
14 cannot be duplicated by copying of codes or keys. Further,  
15 what is lacking in the prior art is a system that is  
16 programmable, only, by the owner or authorized operator of  
17 the vehicle without the possibility of unauthorized  
18 duplication.

19 Also what is lacking in the prior art is a mechanism for  
20 recognizing and verifying less than perfect fingerprint  
21 imprints.

1     DESCRIPTION OF THE PRIOR ART

2

3           U. S. Patent No. 5,686,765 to Washington teaches a  
4     system for preventing unauthorized or unlicensed persons from  
5     using an automobile. In one embodiment, the system has a  
6     remote component that receives and compares physiological  
7     identification entered at the vehicle. If the data match,  
8     the ignition system of the vehicle is energized for normal  
9     operation. In another embodiment, the operator data is  
10    compared to a particular time frame for operation by that  
11    operator during specified times. And in another embodiment,  
12    the system requires subsequent data input to ensure that the  
13    authorized driver remains the current operator. There is  
14    also provision for a bar code reader of an encoded driver's  
15    licence and/or reading the signal of an electronic tether.  
16    The physiological identification data may be generated by a  
17    fingerprint reader or an eyeball scan. This requires a scan  
18    and a transmission to a remote computer.

19           U. S. Patent No. 5,448,659 to Hiroshi teaches the use  
20    of a card-shaped waveguide-type image transmission device to  
21    scan, read and transmit fingerprint data. Again, the  
22    identity input is a fingerprint scan.

23           The fingerprint scanning technology of these prior art  
24    devices produces a representation of the grooves and ridges

1 of the surface of a finger. Therefore, these scans are  
2 highly susceptible to errors caused by extraneous matter such  
3 as dirt, grease, paint, calluses, etc. on the fingers of the  
4 prospective users.

5  
6 SUMMARY OF THE INVENTION  
7

8 Accordingly, it is an objective of the instant invention  
9 to provide a system to secure any vehicle from operation by  
10 an unauthorized user.

11 It is a further objective of the instant invention to  
12 provide a system to identify and authenticate a potential  
13 user of a vehicle by fingerprint information. The system is  
14 referred to as Fingerprint Enrollment and Verification  
15 Module, FEVM.

16 It is yet another objective of the instant invention to  
17 provide a stand alone system hard wired into the electrical  
18 system of a vehicle to authorize and/or control any vehicle  
19 function by an operator placing a finger on a sensor.

20 Other objects and advantages of this invention will  
21 become apparent from the following description taken in  
22 conjunction with the accompanying drawings wherein are set  
23 forth, by way of illustration and example, certain  
24 embodiments of this invention. The drawings constitute a



part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

#### BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a perspective of a door of an automobile;

Figure 2 is a close up perspective of the FEVM housing shown in Figure 1; and

Figure 3 is a flow chart of the operative steps of the fingerprint enrollment and verification module, FEVM.

#### DETAILED DESCRIPTION OF THE INVENTION

The term, "operation," refers to any initiation of any system on a vehicle, to include a range of commands from merely authorizing a system component to perform in a normal manner to energizing the component to perform. For example and not by way of limitation, authorizing door locks to open with a key or electronic device is an operation. Actually opening the door locks is also an operation. Likewise, authorizing engine start with a key and starting the engine are both operations. Use of any of the subsidiary systems of a vehicle, such as, transmission, radio, air conditioner,

1 convertible top, windless, blade, lights, alarm, and the  
2 like, is an operation. The FEVM may be installed to enable  
3 or disable any operation of a vehicle.

4 A vehicle, as used in this disclosure, is any mobile  
5 conveyance. Most vehicles are self propelled and have an  
6 electrical system to operate essential and nonessential  
7 components, such as an automobile, truck, boat, airplane,  
8 earthmoving equipment, motorcycle, farm equipment including  
9 tractors, combines, and military equipment including tanks,  
10 self propelled artillery, armored personnel carriers, to name  
11 a few. The FEVM is wired into the electrical system of the  
12 vehicle to enable or disable the electrically operated  
13 components. Of course, the FEVM would be designed to operate  
14 on the same electrical current used in the vehicle into which  
15 it is to be installed.

16 Vehicles that are not self propelled may be affected by  
17 the FEVM blocking the source of power to the vehicle. Also,  
18 mechanical components may be enabled or disabled by the FEVM,  
19 e.g. by use of solenoids.

20 The FEVM has the capability of storing multiple  
21 fingerprint templates so that a number of operators may  
22 operate the same vehicle. The FEVM has multiple modes which  
23 correspond to different subsystems on the same vehicle and  
24 each subsystem may be operated by a different finger of the

1 same operator. For example, a thumb print may unlock the  
2 doors of an automobile, an index fingerprint may start the  
3 engine, another fingerprint may turn on the cell phone, etc..

4 In Figure 1 an automobile door 10 is shown with a window  
5 11, a door handle 12 and a key lock 13. In one embodiment,  
6 the FEVM 14 is mounted in an aperture in the door near the  
7 door handle. Another embodiment mounts the sensor 18 and the  
8 housing 15 in the door with the sensor connected by wiring to  
9 the FEVM 14 located in another part of the vehicle. The FEVM  
10 may be mounted at any location on the vehicle as a matter of  
11 choice. As shown in Figure 2, the FEVM 14 has a housing 15  
12 surrounding an aperture in the door (not shown) and connected  
13 to the door 10 by screws 16. The housing 15 may be metal or  
14 plastic with other connections used, such as welding or  
15 adhesives. The housing 15 has an opening 17 of such a shape  
16 and size to accommodate the fingerprint of a finger of an  
17 operator of the vehicle. A silicone chip sensor 18 is fixed  
18 in the housing 15 and extends across the opening 17. The  
19 silicone chip is an integral part of a solid state device  
20 having an integrated circuit. The sensor surface or matrix  
21 contains an active antenna array of more than 16,000 elements  
22 and is protected by a hard transparent coating that is  
23 scratch and impact resistant. The matrix is surrounded by a  
24 drive ring which transmits an extremely small signal that the

1 individual antenna elements can detect. When a finger is  
2 placed on the matrix, the drive ring couples a small signal  
3 onto the finger's living subdermal layer. The signal is  
4 received by the antenna elements which creates a digital or  
5 statistical pattern that reflects the finger's unique  
6 underlying structure.

7 In operation the FEVM is connected to the print access  
8 security system programmer 19. The programmer is connected  
9 to the FEVM by plug-in connection. The programmer is powered  
10 by the same voltage as the system into which the FEVM is to  
11 be installed. The programmer controls the loading function  
12 of the FEVM to enroll an operator for operation of a vehicle.

13 The programmer 19 is connected to the FEVM and a mode of  
14 operation is chosen, then the operator places a finger on the  
15 sensor 18. The enroll function of the programmer is  
16 activated by pressing the enroll key. The image of the  
17 fingerprint on the sensor 18 is processed by the FEVM to form  
18 a template of the fingerprint. The template is not a picture  
19 or representation of the actual grooves and ridges of a  
20 fingerprint. The template is statistical information about  
21 the fingerprint image and may be 144 bytes in length. As  
22 such, the FEVM does not require a pristine fingerprint to be  
23 enrolled but may successfully complete the function when the  
24 fingerprint image includes extraneous material, such as

1 perspiration, dirt, paint or grease. When the template is  
2 complete, it is stored in the flash memory to complete the  
3 enrollment function. An indicator will signal the end of  
4 this function. The operator removes his finger from the  
5 sensor.

6 The operator then places the same finger on the sensor a  
7 second time and the verify key on the programmer is  
8 activated. The FEVM compares the image on the sensor to the  
9 template stored in the memory. A signal, such as a green  
10 light, will indicate that the image and the template match.  
11 The operator is now an authorized user of the mode for which  
12 he is verified on the vehicle.

13 This procedure is repeated for each operator and each  
14 mode until complete. The programmer 19 is then unplugged  
15 from the FEVM and stored in a secure location. At this  
16 point, the FEVM is fully programmed with no electrical or  
17 electronic vulnerability. Any physical tampering with the  
18 FEVM would merely disable the hardware without invading the  
19 software.

20 Figure 3 illustrates the steps for opening a door lock  
21 using the FEVM. The prospective operator places a finger on  
22 the passive sensor 18, the sensor activates and detects the  
23 presence of the finger, the fingerprint image is compared to  
24 the templates in the flash memory to verify the prospective

1 user. If there is no verification, ie. no match in the  
2 memory for the prospective operator, the sensor returns to  
3 the detect step. If there is a verification and the  
4 fingerprint image has a template in the memory, the door  
5 unlocks. The finger is removed and the sensor returns to the  
6 passive mode.

7 When the authorized user leaves the car, he again places  
8 his finger on the sensor and the doors lock.

9 A detailed command description of the FEVM follow:

10 Standalone Fingerprint  
11 Enrollment  
12 and  
13 Verification  
14 Module  
15 (FEVM)  
16 Rev 1.0  
17 October 28, 2000

## 18 **Table of Contents**

19	PRINT ACCESS Fingerprint Enrollment and Verification Module
20	Host Interface Command Set
21	Command Summary
22	Basic Concepts
23	Detailed Command Description
24	Status
25	Enroll
26	Verify Parameters
27	Verify

- 1 Baud
- 2 Upload
- 3 Download
- 4 Image
- 5 Store
- 6 Retrieve
- 7 Header
- 8 Signature
- 9 Erase
- 10 Persistent
- 11 Calibrate
- 12 Priveleges
- 13 Restrict
- 14 Set Code
- 15 Serial Interface Command Features
- 16 Power On/Off
- 17 Reset
- 18 Hardware Signals and Connections
- 19 Standalone Connector
- 20 Serial Connector
- 21 Print Access Security Systems Fingerprint Enrollment
- 22 and Verification Module
- 23 Host Interface Command Set
- 24
- 25 Copyright Print Access Security Systems, Inc., 2000.
- 26
- 27 This document describes the host interface command set for

1 the Print Access Security  
2 model of Fingerprint Enrollment and Verification Modules.  
3 Using these commands, all functionality of the Print Access  
4 Security module is exposed to the host CPU. The  
5 commands are simple single byte op-codes that are issued  
6 through the RS-232 interface. There are two types of  
7 commands; immediate and long. Immediate commands return  
8 their results immediately. Long commands require an extended  
9 length of time to  
10 complete. The device status should be polled to determine  
11 when such a command has completed or failed.  
12  
13  
14

#### 15 Command Summary

16  
17 Command Op-code Description Status 0x00Retrieve the 2 byte  
18 device  
19 statusEnroll0x01Generate an enrollment template from a  
20 finger-Verify0x02Verify a finger against an enrollment  
21 template(s)Baud0x03 Set the RS-232 baud rateUpload0x04Send  
22 the active enrollment template to the  
23 hostDownload0x05Download an enrollment template  
24 from host and activateImage0x06Send the enroll Fingerprint  
25 image to the  
26 hostStore0x07Store the active enroll template in the  
27 deviceRetrieve0x08Retrieve an  
28 enroll template from the device and activateHeader0x09Return  
29 the header from a stored templateSignature0x0AReturn the  
30 device signature GEZ6xxrrrErase0x0BErase the  
31 specified stored templatePersistent0x0CMake the current  
32 settings persistentCalibrate0x0DCalibrate the  
33 devicePrivilege0x0EBegin access to privileged  
34 commandsRestrict0x0FEnd access to privileged  
35 commandsSetCode0x10Set a new  
36 privilege codeVerifyParameters0x11Set the verification  
37 parameters  
38  
39

#### 40 Basic Concepts

41  
42 The basic operation of the FEVM is the Enrollment and  
43 Verification of fingerprints. All additional functionality is  
44 simply in support of these two key operations.  
45

46 Enrollment is a process by which a fingerprint image captured  
47 by the sensor is transformed into a template. A template may



1 be up to 144 bytes in length and contains statistical  
2 information about a particular fingerprint image. This  
3 information is  
4 sufficient to perform verification when the same -finger is  
5 again placed on the sensor. The template is not a fingerprint  
6 image.

7  
8 Verification is a process that applies the statistical  
9 information found in an enrolled template against a  
10 fingerprint image currently captured by the sensor- No  
11 fingerprint image is transmitted outside of the FEVM during  
12 verification.

13  
14  
15 Active Enrollment Buffer: The active enrollment buffer is  
16 used to hold an enrollment template. After enrollment it  
17 contains the template that has just been enrolled. Prior to  
18 verification it should be loaded with the template to be  
19 verified. Store and Upload use this Buffer as a source  
20 whereas Download and Retrieve use this buffer as a  
21 destination.

22  
23 Storage Slot: A Storage slot is a piece of Flash memory  
24 allocated within the FEVM to hold enrolled templates.  
25 Enrolled templates may be stored, retrieved or erased from a  
26 storage slot.

27 Detailed Command Description

28  
29 Status

30  
31 Op-code: 00H

32 Type: Immediate

33 Parameters: None

34 Returns:

35 Byte 1: Command Status

36  
37 The bits are described in the following table:

38 **BitMeaning**0St Fail: Previous command failed if  
39 set.

40 1StInEnroll: Performing Enrollment if set.

41 2StInVerify: Performing Verification if set.

42 3StInStore: Storing data in Flash Memory if set.

43 4StInCalibrate: Calibrating if set.

44 6StPermission: Insufficient permissions.

45 7StFinger: A finger is placed on the device if set.

46 Byte 2: Extended Status

47 The extended status byte provides extra status  
48 information for a command. This information is command and

context dependent.

**CommandMeaning** Verify If Bit 0 is set during verification, then the FEVM is performing verification against the internal storage slots. If Bit 0 is clear during verification, then the FEVM is performing verification against the Active Enrollment Buffer. If verification of multiple storage slots has completed then this status byte contains the verified storage slot number if the verification was successful.

-Enroll During enrollment, the bits for this status byte are defined as follows, Bit Meaning 0 The finger pressure needs adjusting if set. See bits 1 and 2 for pressure direction. The yellow LED will be on plus one of the green or red LEDs. 1 If bit 0 is set then too much finger pressure is being applied to the sensor. If bit 0 is cleared then the finger is positioned too far to the left of the sensor. The red LED will be on. (Orientation: LEDs are at the top) 2 If bit 0 is set then too little finger pressure is being applied to the sensor. If bit 0 is clear then the finger is positioned too far to the right of the sensor. The green LED will be on.

#### **Description**

Returns the current status of the device. This command may be invoked at any time.

#### **Enroll**

Op-code: 01H

Type: Long

Parameters: None

Returns: None

#### **Description:**

Initiates enrollment. The command does not complete until a successful enrollment has been achieved. To abort this command the device must be reset. To check for completion of this command, the Status must be polled. The StInEnroll bit will be cleared when this command completes. The host may detect when an individual has placed their finger on the sensor of the device by checking the StFinger bit.

#### **VerifyParameters**

Op-code: 11H

Type: Immediate

Parameters:

1           Byte 1: The storage slot to begin verification from,  
2           Byte 2: The number of storage slots to verify. If  
3 this byte is 0 then verification is performed on the active  
4 enrollment buffer.

5  
6 Returns: None.

#### 7 8 **Description:**

9 This command sunply sets the Verification parameters.  
10 Separating the parameters from the Verify command is useful  
11 when configuring FEW4s. An application may wish to  
12 store multiple templates on an FEVM and then configure it to  
13 perform verification on these templates. Forcing verification  
14 is not necessary. E.g. enrolling an individual from a hotel  
15 lobby and programming their door lock remotely.

16  
17 Note: To make these parameters persistent, the Persistent  
18 command should be called  
19 prior to the next invocation of reset, The Factory defaults  
20 are 0,0.

#### 21 22 **Verify**

23 Op-code: 02H

24 Type: Long

25 Parameters: None. The parameters are set using the  
26 VenfyParameters command.

27 Returns: None.

#### 28 29 **Description:**

30 Initiates verification. The command does not complete until a  
31 successful verification has been achieved. To abort this  
32 command the device must be reset. To check for the  
33 completion of this command, the Status must be polled. The  
34 StInVerify bit in the first status byte will be cleared when  
35 verification has completed. The host may detect when an  
36 individual has placed a finger on the sensor of the device by  
37 checking the StFinger bit. The second status byte may be used  
38 to detect if a multiple verification or an Active Enrollment  
39 Buffer verification is taking place.

#### 40 41 **Baud**

42 Op-code: 03H

43 Type: Immediate

44 Parameters: Byte 1: The new baud rate to be set. Supported  
45 Baud rates are as follows:

#### 46 47 **Baud**

**RateValue**1200024001480029600314,400419,200528,800638,400757,  
6008115,2009  
**Returns:** None.

**Description:**

Change the communication baud rate for the device to the newly supplied baud rate.

Note: To make the new baud rate persistent, the Persistent command should be called prior to the next invocation of reset The factory default is 3 (9600 baud).

**Upload**

Op-code: 04H

Type: Immediate

Parameters: None.

Returns: The currently enrolled template in the active enroll buffer. The actual size of the template must be determined by examining the header of the template. The header is the first 2 bytes of the data being returned.

**Template Header**

**BitsDescription**0-1Reserved2-3The template structure4-6Template types: 3=84 bytes,4=104 bytes,6=144 bytes Sizes include the header and trailer.7Valid template if clear. Invalid (deleted)if set.8-15Reserved for user data

**Description:**

Upload the template in the active enrollment buffer to the host.

**Download**

Op-code. 05H

Type: Immediate

Parameters: A valid template that has been previously uploaded from the device. The size of the download template is determined from the header. (See Upload)

**Returns:** None. The device status should be checked for failure status.

**Description:**

Download a template from the host and store it in the active enrollment buffer. This makes the template available for verification, storage or Upload.

## **Image**

Op-code: 06H

Type: Immediate

Parameters: None

Returns:

Byte 1: The image type id.

0: No image.

1: The next 2 bytes contain the width and height.

Byte 2: The width of the enrollment image in pixels

Byte 3: The height of the enrollment image in pixels

Subsequent Bytes: The enrollment image. This is a black and white image with a bit depth of one.

## **Description:**

This image may be used to visually inspect the image of the finger that was just enrolled- The most unique features of the finger should be in the center of the image. A good enrollment is necessary for easy verification. This visual inspection is not necessary for enrollment but makes enrollment simpler. An alternative may be to enroll and then verify several times to ensure the quality of the enrolled image.

## **Store**

Op-code: 07H

Type: Long

Parameters:

Byte1: The internal FEVM slot number to be used to store the active enrollment template. This number must be between 0 and 63.

Returns: None. To check for success or failure of this command, the device status must be polled. Once the StInStore bit has been cleared from the first status byte, the Failed bit will indicate success or failure of this command.

## **Retrieve**

Op-code: 08H

Type: Immediate

Parameters:

Byte1: The internal FEVM slot number of the enrollment template to be retrieved. This number must be between 0 and 63.

Returns: None. This is an immediate command. The status byte should be checked to determine success or failure.

**Description:** Retrieve the stored template and place it in the active enrollment buffer. This makes the template available for Verify, Upload or Store.

#### **Header**

Op-code: 09H

Type: Immediate

Parameters:

Bytel: The internal FEVM slot number of the enrollment template to be retrieved. This number must be between 0 and 63.

Returns: The 2 byte header from the stored template. Refer to the Upload command for a description of the header.

#### **Description:**

This command is used to recover the header from a stored template. This is useful for applications that may be using the user data component of the header and wish to search through the stored templates to recover this data.

#### **Signature**

Op-code: OAH

Type: Immediate

Parameters: None.

Returns: A string representing the signature of the device. The expected return value is "GEZxxxxrrr" where "xxx" represents the model of the module and rrr represents the revision. E.g "GEZ6Aa001" where 6Aa is the model and 001 is the revision.

**Description:** Returns a device signature string. This command also unlocks the FEVM command engine and must be issued after a reset or power on.

#### **Erase**

Op-code: OBH

Type;Long

Parameters:

Bytel: The internal FEVM slot number of the enrollment template to be erased. This number must be between 0 and 63.

Returns: None. The status of the device should be polled to determine the success or failure of this command. The StInStore bit will be cleared when the command has completed.

**Description:** Erase the enrolled template stored in the FEVM at the given slot number.

**Persistent**

Op-code: OCH

Type: Long

Parameters: To help eliminate the possible accidental invocation of this command, the command accepts the op-code (OCH) as the one-byte parameter.

**Returns:** None. The device status should be polled to determine the success or failure of this command. The StInStore bit will be cleared when the command has completed.

**Description:** This command will make the current calibration, verification, baud rate and Privilege code settings persistent.

**Calibrate**

Op-code: ODH

Type: Long

Parameters: None.

Returns: None. The device status should be polled to determine when the calibration has finished. The StInCalibrate bit will be cleared when the command has completed. The newly calibrated values will be made persistent if the Persistent command is invoked.

**Description:** This command will cause the FEVM to perform calibration. No finger should be present on the FEVM sensor when calibration is being performed.

Note: To make this calibration persistent, the Persistent command should be invoked prior to the next reset.

**Privileges**

Op-code: OEH

Type: Immediate

Parameters: The Privilege code. This is the code previously set using SetCode. It is 6 bytes long. If a Privilege code has never been set for this device, then the parameter must be set but is ignored.

Returns: None. The device status should be polled to determine if privileges have been granted. The StPrivilege and StFail bits in the status word will be set

1 if the privilege code was invalid-

2  
3 **Description:** If the privilege code that is given matches the  
4 privilege code that is currently stored in the FEVM, then  
5 permission is granted to perform Image, Download, Persistent,  
6 Enroll, Store and Erase.

7  
8 Note: If no privilege code has been previously set then all  
9 privileges are granted without the necessity of calling the  
10 Privilege command.

### 11 12 13 **Restrict**

14 Op-code: OFH  
15 Type: Immediate  
16 Parameters: None.  
17 Returns: None.

18  
19  
20 **Description:** If privileges are currently active, then this  
21 commands disables access to privileged operations thereby  
22 disabling Image, Download, Persistent, Enroll, Store and  
23 Erase.

24  
25 Note: If the Privilege code has been made persistent then  
26 resetting the device will have the same effect as calling  
27 Restrict

### 28 29 **SetCode**

30 Op-code:10H  
31 Type: Immediate  
32 Parameters: First 6 bytes: The currently set Privilege code.  
33 If no privilege code currently exists, then this parameter  
34 should contain 6 bytes of zeroes.  
35 Next 6 bytes: The new Privilege code.

36  
37 **Description:** Sets a Privilege code for the FEW This privilege  
38 code is used with the Privilege command and is used to  
39 control access to Image, Download, Persistent, Enroll, Store  
40 and Erase.

41  
42 Note: To make new Privilege code persistent, the Persistent  
43 command should be called prior to the next invocation of  
44 reset. The factory default is 0x000000000000.

45  
46 Serial Interface Command Features  
47



1 Power On/Off

2 To power the device off, bring the DTR signal low (0). This  
3 will cause power to the device to be dropped down to nominal  
4 levels and prevent it from functioning. Bringing DTR high (1)  
5 will cause the device to resume operation. All non-persistent  
6 setting will have been lost and must be reprogrammed.

## 8 **Reset**

9 To reset the device, simply toggle the power off and back on  
10 using DTR as described above. A delay should be added after  
11 power on before the device is fully functional. This delay is  
12 approximately 200 ms.

## 14 **Hardware Signals and Connections**

16 The fingerprint module interface connectors are located on  
17 the back of the module (see FIG. 1). Viewing the module from  
18 the backside, with the connectors on the top edge, the  
19 STANDALONE connector will be on your right side, and the  
20 SERIAL connector is on the left side. The connectors are  
21 manufactured by Hirose Electric and belong to the FH12 series  
22 of 0.5mm-pitch flex-cable connectors. An appropriate cable to  
23 use with these connectors would be Parlex Corporation  
24 part#0.5MM-10-2-B.

26 CAUTION. All module input signals are rated at 3.3 volts, and  
27 they are NOT 5 volt tolerant. All module output signals must  
28 be buffered if they are required to drive LEDs, etc.

### 30 **Standalone Connector**

32 The standalone connector allows the FEVM to operate without  
33 an additional micro controller. A serial interface will still  
34 be required to program the FEVM with templates, Privilege  
35 code and verify parameters.

#### 37 **Standalone Connector**

38 **NAMEDIRECTION\*\*FUNCTION**IVCC5VINPUT5

39 volt supply2GND-power/signal ground3GND-power/signal  
40 ground4CTRL-OUT-OUTPUTActive low output indicating  
41 verification successful.

42 When buffered, may be used to drive lock mechanisms, etc.

43 5PB9-OUTPUTYellow LED

44 active low output.6PB7-OUTPUTRed LED active low output.7PB6-  
45 OUTPUTGreen

46 LED active low output. 8PB4-INPUTENROLL user switch control -  
47 active low9PB5

1 -INPUTVERIFY user switch control - active low I<sup>0</sup>INTA-  
2 INPUTSTART user switch control - active low (shared with BOOT  
3 mode control - DO NOT use during DSP boot sequence.)\*\* all  
4 signal directions are with respect to the fingerprint module  
5 (ie. INPUT indicates input for the module)  
6

7 CAUTION: All module input signals are rated at 3.3 volts, and  
8 they are NOT 5 volt tolerant. All module output signals must.  
9 be buffered if they are required to drive LEDs, etc.

#### 10 Functional Description of I/O Signals:

11 To perform enrollment using the Standalone Connector:

- 12 • PB<sub>4</sub> should be brought low for at least 20 ms then  
13 returned to high. The green LED will be on.
- 14 • PB<sub>5</sub> should be brought low for at least 20 ms then  
15 returned to high- The green LED will be off
- 16 • The device will be in enrollment mode. (No LEDs are  
17 on)
- 18 • Place a finger on the sensor.
- 19 • If PB<sub>7</sub> (red LED on) is low and PB<sub>9</sub> (yellow LED is  
20 off) is high then the finger placed is too far to the left.
- 21 • If PB<sub>6</sub> (green LED on) is low and PB<sub>9</sub> (yellow LED is  
22 off) is high then the finger placed is too far to the right.
- 23 • If PB<sub>7</sub> is low and PB<sub>9</sub> is low then too much pressure  
24 is being applied to the sensor (or the finger is too moist).
- 25 • If PB<sub>6</sub> is low and PB<sub>9</sub> is low then too little  
26 pressure is being applied to the sensor.
- 27 • Upon successful enrollment PB<sub>6</sub> and PB<sub>7</sub> are high and  
28 PB<sub>9</sub> is low (yellow LED is on).

29 To perform verification using the Standalone Connector:

- 30 • PB<sub>5</sub> should be brought low for at least 20 ms then  
31 returned to high.
- 32 • The device will be in verification mode.
- 33 • When verification is successful, CTRL - OUT will be  
34 made high, otherwise it will remain low. (Future  
35 implementation) The green LED will be on.

36 To cancel either enrollment or verification, INTA should  
37 be brought low for at least 20 ms and then returned to high-  
38 This will effectively reset all device parameters and return  
39 it to monitor mode.

#### 40 Serial Connector

41 The serial connector is used to interface the FEVM with an  
42 external CPU. This CPU has access to all the FEVM  
43

1 functionality.

2  
3 Serial Connector **PIN#PIN NAME DIRECTION\*\*FUNCTION**1VCC5VINPUT5  
4 volt  
5 supply2VCC5VINPUT5 volt supply3GND-power/signal ground4GND-  
6 power/signal  
7 ground5GND-power/signal ground6CTS-INPUT(reserved)  
8 Functionality will change in  
9 future revisions. 7RTS-OUTPUT(reserved) Functionality will  
10 change future revisions. 8RXINPUTRS-232 serial data  
11 input.9TXOUTPUTRS-232 serial data  
12 output. 10SYS-RESET-INPUTModule reset/power-down. Active  
13 low.\*\* all signal directions are with respect to the  
14 fingerprint module (ie. INPUT indicates input for the module)

15  
16 CAUTION: All module input signals are rated at 3.3 volts, and  
17 they are NOT 5 volt tolerant. All module output signals must  
18 be buffered if they are required to drive LEDs, etc.

19  
20 It is to be understood that while a certain form of the  
21 invention is illustrated, it is not to be limited to the  
22 specific form or arrangement of parts herein described and  
23 shown. It will be apparent to those skilled in the art that  
24 various changes may be made without departing from the scope  
25 of the invention and the invention is not to be considered  
26 limited to what is shown and described in the specification  
27 and drawings.

1  
2 CLAIMS  
3

4 What is claimed is:  
5

6           Claim 1. A print access security system for  
7 authorization to operate a vehicle comprising a fingerprint  
8 enrollment and verification module, FEVM, adapted for  
9 electrical connection to the electrical system of a vehicle,  
10 said FEVM having an opening of sufficient size to accept a  
11 finger, a sensor means mounted in said opening of said FEVM  
12 to capture a fingerprint image for authorization to operate  
13 the vehicle.  
14

15           Claim 2. A print access security system of claim 1  
16 wherein said FEVM has a flash memory and a plurality of  
17 preselectable modes, one of said modes being an FEVM  
18 enrollment mode, said FEVM enrollment mode transforms said  
19 fingerprint image to a template, said template having  
20 statistical information about said fingerprint image, said  
21 template communicated to said flash memory for archiving said  
22 fingerprint template.  
23

24           Claim 3. A print access security system of claim 2  
25 wherein said FEVM preselectable modes includes a FEVM  
26 verification mode wherein said FEVM applies said statistical  
27 information of said archived template to a current

1 fingerprint image captured by said sensor means.

2  
3 Claim 4. A print access security system of claim 3  
4 wherein operation of a vehicle is denied by said FEVM when  
5 said archived template and said current image do not match.

6  
7 Claim 5. A print access security system of claim 4  
8 wherein operation of a vehicle is permitted by said FEVM when  
9 said archived template and said current image match.

10  
11 Claim 6. A print access security system of claim 4  
12 wherein said vehicle has passenger doors, said FEVM mounted  
13 on one of said passenger doors, said FEVM electrically wired  
14 into the electrical system of said vehicle, said opening  
15 facing outwardly exposing said sensor means.

16  
17 Claim 7. A print access security system of claim 6  
18 wherein said vehicle has an electrical door lock circuit and  
19 said passenger doors have electrically powered door locks  
20 connected to said electrical door lock circuit, said FEVM is  
21 electrically connected to said door lock circuit, said FEVM  
22 acting as a switch in said circuit, said switch not  
23 activating said circuit when said template and said image do  
24 not match.

1           Claim 8. A print access security system of claim 5  
2 wherein said vehicle has passenger doors and an electrical  
3 door lock circuit, said doors including electrically powered  
4 door locks connected to said electrical door lock circuit,  
5 said FEVM is electrically connected to said door lock  
6 circuit, said FEVM acting as a switch in said circuit, said  
7 switch activating said circuit when said template and said  
8 image match.

9  
10           Claim 9. A print access security system of claim 8  
11 wherein said FEVM energizes said door locks and unlocks said  
12 doors.

13  
14           Claim 10. A print access security system of claim 3  
15 wherein said FEVM is mounted in said vehicle and said FEVM is  
16 electrically wired into the electrical system of said  
17 vehicle, said opening facing outwardly exposing said sensor  
18 means.

19  
20           Claim 11. A print access security system of claim 10  
21 wherein said vehicle electrical system includes circuits to a  
22 multiplicity of subsidiary systems, said FEVM having a  
23 plurality of selectable modes corresponding to said circuits,  
24 said FEVM connected to each of said circuits, said FEVM  
25 acting as a switch in said circuits, said FEVM not activating

1 a corresponding circuit when a particular mode is selected  
2 and said template and said current image do not match.

3  
4 Claim 12. A print access security system of claim 11  
5 wherein said FEVM activates a corresponding circuit when a  
6 particular mode is selected and said current image and said  
7 template match.

8  
9 Claim 13. A print access security system of claim 12  
10 wherein said FEVM energizes said circuit and operates said  
11 subsidiary system.

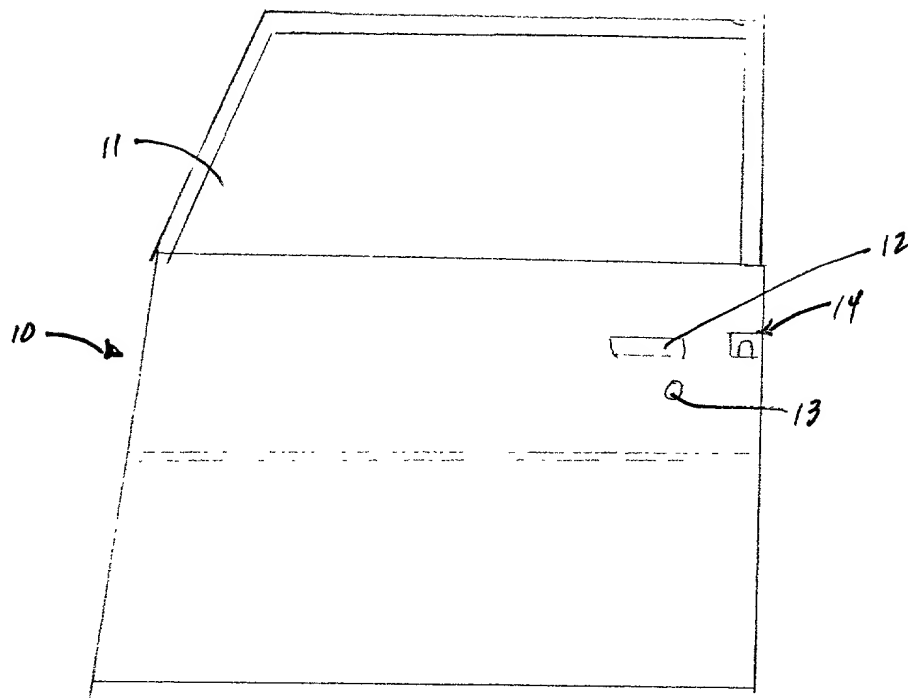
ABSTRACT

A fingerprint enrollment and verification module is connected to the electrical circuit of a vehicle to prevent operation of the vehicle by unauthorized users. The module has a sensor that creates a template of a fingerprint when a finger is placed on the module. The module has a flash memory to store enrolled templates and a verification step. After a fingerprint has been enrolled in the module, any operation of that vehicle is possible only after the user's fingerprint is verified to match the enrolled template.

I:\CFR\2224.000 Fingerprint Entry



Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	



F. G. 1

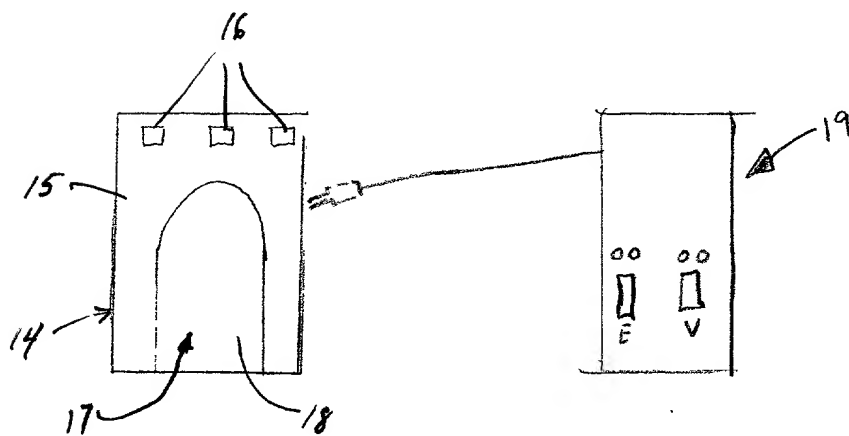
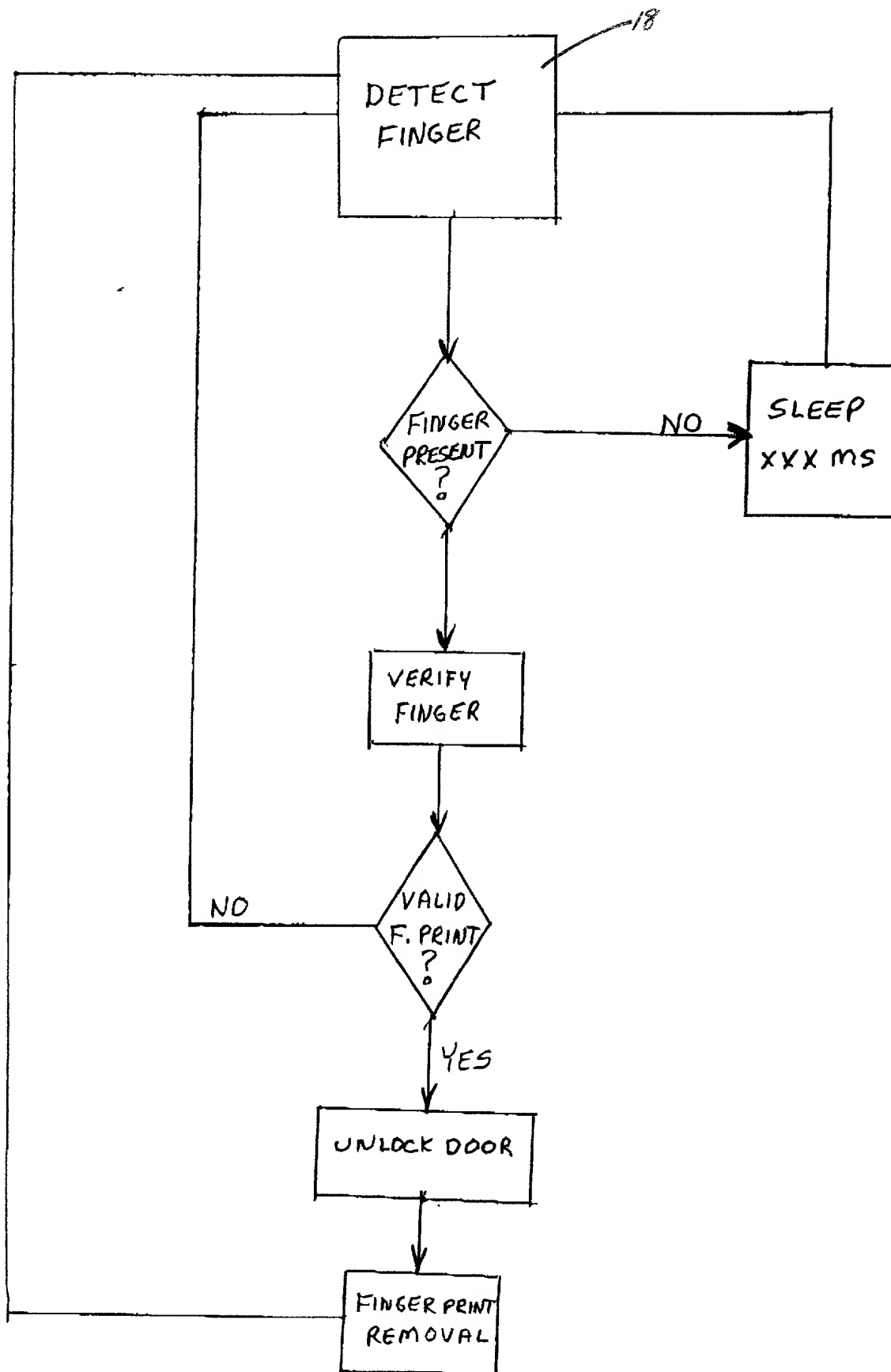


FIG. 2

FIG 3



**DECLARATION FOR UTILITY OR DESIGN  
PATENT APPLICATION (37 CFR 1.63)**

**Attorney Docket No.: 2224.001**

**Inventor Name:** Odle et al

**COMPLETE IF KNOWN**

☒ Decl. Sub. w/Initial Filing  
☐ Decl. Sub. after Initial Filing (surcharge (37 CFR 1.15 (e)))

Application No: /  
Filing Date:  
Group Art Unit:  
Examiner Name:

**As a below named inventor, I hereby declare that:**

My residence, post office addr., and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**PRINT ACCESS SECURITY SYSTEM**

the specification which

☒ is attached hereto OR

☐ was filed on \_\_\_\_\_ As United States Application No. or PCT Intl. Appln. No. \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN NUMBERS:	COUNTRY:	FOREIGN FILING DATE:	PRIORITY NOT CLAIMED:	CERTIFIED COPY Yes	COPY No

Additional foreign appln. nos. are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below:

**APPLICATION NUMBER(s):**

**FILING DATE:**

\_\_\_\_ Addnl. provisional appln. Nos. are listed on a Supplementary priority data Sheet PTO/SB/02B attached.

# DECLARATION - UTILITY or DESIGN PATENT APPLICATION

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

U.S. PARENT APPLICATION  
or PCT NUMBER:

PARENT FILING DATE:

PARENT PATENT NO:  
(if applicable)

Additional U.S. or PCT international appln.nos. are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: X Customer No: 21917 PLACE CUSTOMER No.  
BAR CODE LABEL HERE

OR

Registered practitioner(s) name/registration no. listed below.

NAME:	REGISTRATION NO:	NAME:	REGISTRATION NO:
Michael A. Slavin	34,016	Joe Beckman	45,529
Ferris H. Lander	43,377	Karen Messick	46,256
C. Fred Rosenbaum	27,110		

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 17 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: A Petition has been filed for this unsigned inv.

GIVEN NAME (first and middle [if any]):

FAMILY NAME OR SURNAME:

Richard

Odle

Inventor's signature:

Richard Odle

Date:

11/20/00

Residence: 5336 2<sup>nd</sup> Rd.

City: Lake Worth State: FL 33461 Country: U.S. Citizenship: U.S.

Post Office Address: 5336 2<sup>nd</sup> Rd., Lake Worth, FL 33461

Additional inventors are being named on the X Supplemental additional inventor(s) sheet(s) PTO/SB/02A attached hereto.

NAME OF SECOND INVENTOR: A Petition has been filed for this unsigned inv

GIVEN NAME (first and middle (if any)):

FAMILY NAME OR SURNAME:

GaryOdleInventor's signature: [Signature] Date: 11/29/00Residence: 14900 Stirrup LaneCity: West Palm Beach State: FL 33414 Country: U.S. Citizenship: U.S.Post Office Address: 14900 Stirrup Lane, West Palm Beach, FL 33414NAME OF THIRD INVENTOR: A Petition has been filed for this unsigned inv.

GIVEN NAME (first and middle (if any)):

FAMILY NAME OR SURNAME:

Robert E.HenryInventor's signature: X Robert E Henry Date: 11-21-2000Residence: 2461 Village Blvd.City: West Palm Beach State: FL 33409 Country: U.S. Citizenship: U.S.Post Office Address: 2461 Village Blvd., West Palm Beach, FL 33409NAME OF FOURTH FIRST INVENTOR: A Petition has been filed for this unsigned

GIVEN NAME (first and middle (if any)):

FAMILY NAME OR SURNAME:

DavidCoriatyInventor's signature: [Signature] Date: 11/29/00Residence: 144 Coccolum LaneCity: Royal Palm Beach State: FL 33411 Country: Canadian Citizenship: CanadianPost Office Address: 144 Coccolum Lane, Royal Palm Beach, FL 33411

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